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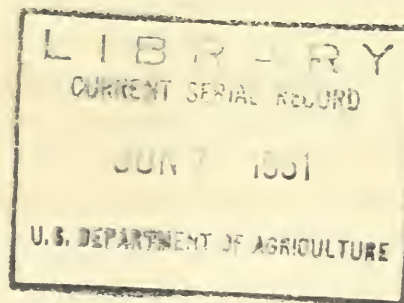
x THE MORE IMPORTANT FOREST INSECTS IN 1950--<sup>dark</sup>A SUMMARY x

Prepared by the Division of Forest Insect Investigations

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This summary has been prepared to record the occurrence of the more important forest insects in the United States, as compiled from surveys and miscellaneous reports from the field stations of the Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, located in the various forest regions of the country. Some of the information was obtained through surveys on lands administered by Federal agencies such as the Forest Service of the Department of Agriculture, and the National Park Service, the Office of Indian Affairs, and the Fish and Wildlife Service of the Department of the Interior. Other information was made available through cooperative efforts with State entomological and conservation agencies and with private timberland owners.



At the present time, under provisions of the Forest Pest Control Act, forest-insect surveys are being conducted from eight widely separated field stations. These stations are located in the various forest regions established by the U.S. Forest Service, the lone exception being the region embracing New Mexico and Arizona. Headquarters for these stations and the territory each covers are as follows:

Coeur d'Alene, Idaho

Northern Region (1)--Northern Idaho, Montana, and northeastern Washington.

Fort Collins, Colo.

Rocky Mountain Region (2)--Colorado, Wyoming, South Dakota, and Nebraska.

Ogden, Utah

Intermountain Region (4)--Utah, Nevada, southern Idaho, and western Wyoming.

Berkeley, Calif.

California, Region (5)--California and a portion of western Nevada.

Portland, Oreg.

Pacific Northwest Region (6)--Oregon and most of Washington.

New Haven, Conn.

Eastern Region (7)--New England States, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia and West Virginia.

Asheville, N. C.

Southern Region (8)--The entire southern portion of the country west to Texas and Arkansas.

Milwaukee, Wis.

North Central Region (9)--Lake States, Ohio, Indiana, Illinois, Missouri, and North Dakota.

The Southwestern Region (3)--New Mexico and Arizona--is at present being served jointly by the Fort Collins and Ogden stations; the southern part of the Eastern Region is served by the Beltsville, Md., research station; the Gulfport, Miss., research station has assisted in the southern surveys, particularly in Arkansas and Texas; and the Columbus, Ohio research station has supplied general information from the Central States, not available through the Milwaukee station.

The personnel in these stations of the Division of Forest Insect Investigations form the core of the forest-insect survey organization. However, they do not comprise the entire organization. Personnel are also furnished by other Federal agencies, such as the Forest Service, the various States, and many private timberland owners. The closely coordinated efforts of all these individuals make possible the activity of the organization. One of the principal functions of the Division of Forest Insect Investigations is to coordinate the work of all these agencies and individuals and to provide technical information on the survey techniques to be employed.

In 1950 two of the most ambitious forest-insect control programs ever conducted in the United States were undertaken. They were (1) the airplane-spraying project to control the spruce budworm in the Douglas-fir and white fir forests in Oregon and Washington, and (2) the chemical treatment of Engelmann spruce trees to kill active broods and to prevent further dispersal of the Engelmann spruce beetle in the Nation's<sup>al</sup> forests of Colorado. Surveys played an important role in the development of these programs. They served as a basis for requests for control funds, and the information they provided was of primary importance to the conduct of the program.

**SPRUCE BUDWORM (Choristoneura fumiferana (Clem.)).**--The spruce budworm continued to be a major threat to the Douglas-fir and white fir forests of Oregon and Washington, being in outbreak status on almost 3 million acres. The most extensive areas of infestation were in the Blue Mountains of Oregon where the infestation was still in epidemic stage on 1,810,000 acres. In western Oregon epidemic conditions were found on 96,405 acres, and in the eastern Oregon Cascades, an epidemic infestation is now present on 104,460 acres, and there are strong indications that this acreage will increase unless the insect is checked. The eastern Washington Cascades have new centers of infestation totaling 25,440 acres. In addition there are extensive areas in both States where the budworm is present in small numbers. Timber valued conservatively at \$63,000,000 on the stump is seriously threatened. Manufactured into forest products, this timber represents a market value of \$1,500,000,000. Over 900,000 acres were sprayed in 1950 by the Federal Forest Service and the State of Oregon under the technical direction of the Bureau of Entomology and Plant Quarantine. Plans are being laid by these agencies and the State of Washington to spray more than 1,000,000 acres in the spring of 1951, and it is hoped the control project will be completed in the spring of 1952 by spraying the remainder of the heavily infested areas.

The budworm situation in Maine has not materially changed for the worse, populations being still too low to cause appreciable injury to the trees. The 1950 surveys, in cooperation with the Maine Forest Service, indicated, however, that a high proportion of the balsam fir on approximately 560,000 acres in northern Aroostook County suffered noticeable defoliation during the current season, and that occasional fir trees on an additional 3,000,000 acres were fed on lightly. The insect remained at a low level of population in all other parts of the spruce-fir region of the Northeast.

This insect caused severe defoliation of Douglas-fir in two relatively small areas near Boulder, Mon., and Lewiston, Idaho, and there were indications of a build-up in new spots of infestation in Swan Valley, north of Missoula, Mont.. It was also found on Douglas-fir, the true firs, and Engelmann spruce on the Sawtooth and Boise National Forests in south-central Idaho, but no serious timber losses are threatened at the present time.

In the fir types in parts of northern New Mexico, southern Colorado, northern Arizona, and southern Utah the population was heavy enough to cause concern to the land-managing agencies. While its feeding has neither resulted in loss of timber nor inducing bark beetle attacks, excepting in the Sandia Mountains on the Cibola National Forest in New Mexico, damage to reproduction has been serious. An aerial control project on 4,800 acres in the Sandia Mountains in 1950 was very effective.

The budworm outbreak in Douglas-fir stands on the Pike National Forest in Colorado was reduced naturally, only a small fraction of the 135,000 acres infested in 1949 being involved in 1950. There is a possible threat of a budworm build-up on 25,000 acres of Engelmann spruce and Douglas-fir at the north rim of the Grand Canyon National Park and neighboring parts of the Kaibab National Forest in northern Arizona. Some defoliation of white fir was noted throughout the east side timber stands of California during 1950 and in the north and south Warner Mountains of Modoc County. No tree mortality was noted. Localized endemic populations were reported on spruce and balsam fir in Upper Michigan.

The jack pine form of the budworm is at present one of the most important defoliators of jack and Scotch pines in the Lake States. Serious outbreaks occurred in central Michigan, where approximately 1,150,000 acres of jack pine type were heavily infested. Surveys on the Huron National Forest indicated that 85 percent of the 51,886 acres of jack pine within the western third of the forest was 10 to 50 percent defoliated. The second, and less serious of the two outbreaks, occurred on the Hiawatha National Forest in northern Michigan, where 7,000 acres were heavily infested. Silvicultural control measures will be initiated on the Huron Forest in 1951, and insecticidal control measures will be applied on the Hiawatha Forest.

ENGELMANN SPRUCE BEETLE (Dendroctonus engelmanni Hopk.).-- The destructive outbreak of this beetle continued in the Engelmann spruce forests of Colorado in 1950. Valuable timber trees, located principally on the Routt and Arapaho National Forests, were killed by the hundreds of thousands, to add to the incredible volume of some  $3\frac{1}{2}$  billion board feet of Engelmann spruce killed in the previous decade. The first wholesale effort to halt the loss from this outbreak was made by the Bureau of Entomology and Plant Quarantine and the Forest Service in 1950, when approximately 800,000 infested trees along the eastern and southern fringes of the infested area were treated with insecticides to kill active beetle broods and prevent their further dispersal. This control program was in the nature of a delaying action and should be supplemented by additional work in 1951, and possibly in 1952, before the full effect of the control program will be felt. In some of the stands woodpeckers were an important natural control factor; they ate or caused the destruction of untold numbers of the insects in all stages. On many trees their controlling effect was complete or nearly so thereby necessitating only partial treatment, if any.

Elsewhere throughout the Engelmann spruce types losses were not severe. Local outbreaks occurred on the Dixie and Fishlake National Forests in southern Utah, and on the Payette National Forest in southwestern Idaho.

**MOUNTAIN PINE BEETLE** (Dendroctonus monticolae Hopk.).--The mountain pine beetle continues to be one of California's major pests and in some years it readily attacks and kills many of the largest and finest sugar pines; the heavy killing in 1949 did not, however, recur in 1950. Many of the mature and overmature lodgepole pines in campsites at the Devil's Post Pile National Monument southeast of Yosemite National Park were attacked and killed by this insect, but conditions are not threatening to stands in the vicinity. A spectacular outbreak occurred in 1950 in ponderosa pine in dense second-growth, privately owned recreational stands along the east shore of Lake Tahoe in Nevada, where approximately 1,000 trees were killed.

Serious infestations also occurred in white pine stands on the Clearwater and Coeur d'Alene National Forests in northern Idaho, and in lodgepole pine stands on the Kootenai and Cabinet National Forests in northwestern Montana. Control measures in 1949 on 19 lodgepole pine areas, totaling 67,744 acres on the Thompson River Project, Cabinet National Forest, were successful, and the 1950 surveys indicated only 4 units, totaling 8,890 acres (3,744 trees) where treatment was necessary.

An aggressive and extensive attack has persisted for 5 years in lodgepole pine stands on the Caribou, Targhee, Teton, and Bridger National Forests and in the Grand Teton National Park in southeastern Idaho and western Wyoming. However, a cooperative control project conducted by the Forest Service and the Bureau of Entomology and Plant Quarantine has practically eliminated the infestation, and only a few thousand trees in the National Park remained to be treated in 1951. Localized infestations were found in lodgepole stands on the Sawtooth and Minidoka National Forests in southern Idaho.

Another aggressive infestation is present in lodgepole pine on the Deschutes National Forest near Bend, Oreg. Approximately 21,000 acres are heavily infested, and the Forest Service is planning to carry out a salvage operation in this area. This outbreak is a real threat to the entire 1,232,500 acres of lodgepole pine type in Deschutes, Klamath, and Lake Counties, Oreg.. The beetle continued to be locally epidemic also in many white pine and lodgepole pine stands in the Cascades Range of Oregon and Washington. The affected stands are predominantly unmerchantable. Other outbreaks in non-commercial stands of lodgepole pine and stagnated second-growth ponderosa pine occurred in the Blue Mountains of Oregon.

Outbreak conditions have persisted in lodgepole pine stands on the Wasatch and Ashley National Forests in eastern Utah since 1945. There has been no control treatment, and between 90,000 and 120,000 trees have

been killed annually for the past three years.

**BLACK HILLS BEETLE (Dendroctonus ponderosae Hopk.).**--The control operations by the Forest Service on the Harney and Black Hills National Forests and by the State of South Dakota on adjacent lands in 1949 reduced the infestation of the Black Hills beetle in ponderosa pine to such an extent that only 2,400 "bug trees" were found by the Bureau of Entomology and Plant Quarantine in the 1950 surveys. The situation on the Roosevelt National Forest in Colorado remained substantially the same as in 1949, approximately 36,200 ponderosa pines being attacked on 18,900 acres of type. Black Hills beetle attacks of ponderosa pine in the Denver Mountain Parks and on the Black Forest, the San Isabel, San Juan, and Uncompahgre National Forests in Colorado were sufficiently numerous in 1950, however, to recommend control operations over small acreages.

An estimated 32,100 ponderosa pines and 3,200 lodgepole pines were attacked by this bark beetle on the Bighorn National Forest and adjacent private and State lands in Wyoming. Approximately 1,500 of the attacked ponderosa pines are on the National Forest.

Surveys on the Dixie National Forest in Utah indicated the necessity for control treatment of an estimated 3,800 ponderosa pine trees on 45,360 acres. It is expected this control operation will be carried out. A small outbreak, involving 250 ponderosa pine trees, was found on 7,700 acres on the Ashley National Forest, Utah.

**WESTERN PINE BEETLE (Dendroctonus brevicomis Lec.).**--The western pine beetle increased considerably in abundance in ponderosa pine stands on the Payette and Boise National Forests in southwestern Idaho. Control operations on 4,000 trees on 6,000 acres in the Deadwood unit of the Boise Forest have been recommended. Approximately 2,800 ponderosa pines in several other units on both Forests were also attacked.

Severe outbreaks occurred in ponderosa pine stands in the central and southern Sierra regions of California resulting in considerable mortality. Two local outbreaks in the northeastern section of the State caused heavy tree killing, but the over-all rate of loss throughout the 2½ million acres of commercial pine timber in this subregion was not severe. The large-scale application of light cuttings to remove high risk and susceptible trees from these virgin pine stands has, however, prevented in large part any dangerous build-up of beetle populations and resulting heavy timber loss over large acreages. Each island of pine timber throughout the recreational areas along the central coast and in southern California suffered heavy losses during the year. The very nature of the heavy recreational use of these pine areas, the continued clearing for expanded developments and other activities such as road construction, campgrounds, and organizational sites, and drought conditions for the past six years, served to decrease tree vigor and made many trees subject to beetle attack. In many places group-killing of young Coulter pines occurred.

Current infestations of the western pine beetle in Oregon and Washington were uniformly low. Selective logging methods, now widely practiced, and a series of years of good growing conditions have combined to keep the insect in check, and no control measures are needed in 1951.

**SOUTHERN PINE BEETLE** (Dendroctonus frontalis Zimm.).--The southern pine beetle was by far the most important forest insect in the southern part of the United States in 1950. It occurred in outbreak form on approximately 120,000 acres in the relatively inaccessible Big Thicket in Hardin and Liberty counties in east Texas, as shown by surveys conducted by the Bureau of Entomology and Plant Quarantine and the Texas Forest Service. More than 80 separate areas, varying in size from small groups of trees to stands covering as much as 200 acres, were heavily infested. Based on timber losses in previous outbreaks of this insect, destruction in these east-Texas stands may not be considered astounding. However, the Texas Forest Service estimated that over 32,000,000 board feet of pine were killed in 1950 and a total volume of 300,000,000 board feet, most of it being loblolly pine, is threatened. Contributing to the monetary loss was the degrade caused by wood borers and ambrosia beetles. Although recommendations for control were suggested, as a result of tests made by the Gulfport station of the Bureau of Entomology and Plant Quarantine, no treatments had been made by late November. This was, in large part, due to the fact that the State has had no control legislation such as is in force in Oregon and other States, and no definite action could be undertaken. Many of the lumber companies, however, are making strenuous efforts to dispose of the current brood trees through salvage logging practices.

A serious infestation has developed in loblolly pine stands in and adjacent to the Croatan Ranger District on the Pisgah-Croatan National Forest in eastern North Carolina. Nearly 1,000,000 board feet of timber have already been killed and little is known concerning the extent of the infestation. Surveys will be carried out in 1951.

Small-scale infestations were reported in pitch pine stands in the Great Smoky Mountains National Park in North Carolina and Tennessee and on roadside pitch and shortleaf pines along the Blue Ridge Parkway in Virginia and North Carolina.

**DOUGLAS-FIR BEETLE** (Dendroctonus pseudotsugae Hopk.).--The Douglas-fir beetle was at an epidemic level in 1950 in Douglas-fir on the Roosevelt National Forest, the Rocky Mountain National Park, and private lands between these Federal-owned areas. The aesthetic values, rather than commercial timber values, are at stake in these Colorado areas, and control of this outbreak, involving approximately 3,400 trees, is planned before the beetle flight in 1951.

Although the Douglas-fir beetle is scattered generally over very large areas throughout the Intermountain Region, the losses in 1950 were confined to small groups of trees. General observations, however, indicated that infested trees were less abundant than in 1950.

OTHER Dendroctonus SPECIES.--The southwestern pine beetle (Dendroctonus barberi Hopk.), the roundheaded pine beetle (D. convexifrons Hopk.), and the Colorado pine beetle (D. approximatus Dietz.) have built up to epidemic levels in ponderosa pine stands on private and federal lands within the limits of the Lincoln National Forest and the Mescalero Apache Indian Reservation in New Mexico. An estimated 15,940 ponderosa pines on 2,512 acres in these stands were attacked in 1950. Recommendations for control were impossible because of the lack of knowledge concerning the susceptibility of these bark beetles to chemical formulations of ortho-dichlorobenzene or ethylene dibromide. Preliminary tests were made in November 1950, and the sprayed trees will be examined in April 1951 to determine whether or not control is possible with any of these treatments.

The Jeffrey pine beetle (Dendroctonus jeffreyi Hopk.) was less active in 1950 throughout the range of Jeffrey pine in northeastern California than in 1949, there being a 40-percent decrease in volume of timber destroyed by it. Increased losses occurred, however, in several of the southern California recreational areas, chiefly among mature or over-mature trees, or those that had been injured by lightning or other causes.

There are indications that the black turpentine beetle (Dendroctonus terebrans (Oliv.)) , is becoming very aggressive throughout the South. In 1950, it caused some mortality of southern pines in stands scattered from Virginia to Texas and Florida. In Florida, the attacks were most numerous in dry-faced turpentine trees and trees affected by drought. In Texas, they were induced by logging damage along feeder roads. In Louisiana, about 1,000,000 board feet of timber and an unknown quantity of pulpwood were salvaged from 30,000 acres following killing attacks by this beetle. In southern California, the red turpentine beetle (D. valens Lec.) is showing similar aggressive tendencies, where it is killing pines by attacking the basal portions and roots of apparently healthy trees.

The eastern spruce beetle (Dendroctonus piceaperda Hopk.) has been present in virgin and old-growth red spruce in the Adirondack region of New York for many years, and considerable tree mortality has occurred annually, especially in the State-owned areas where cutting is prohibited. The extensive blowdown of spruce, over an area of approximately 50,000 acres, in a severe windstorm in late November 1950, caused this beetle situation to be more acute. Additional losses will result unless control measures and salvage operations are promptly undertaken.

ENGRAVER BEETLES.--Throughout the United States the engraver bark beetles are of importance in forested areas and plantations. Attacks may be induced by a variety of factors including over-maturity, drought conditions, cutting operations, blowdowns, root rots, and attacks by other insects.

The Oregon pine engraver (Ips oregoni Eichh.) causes top-killing of mature trees throughout the West. It is also of importance in residual ponderosa pine stands following selective cuttings. This species was active in California during the late fall months near small saw-mill cuttings and slashings. There was some loss in reserve stands in Mendocino county and in local areas along the lower elevation pine stands in the southern Sierras.

The fir engraver (Scolytus ventralis Lec.) continued to be of importance in white fir in the Sandia Ski area on the Cibola National Forest, New Mexico. The 1949 attacks were controlled by "ortho-oil" in 1950, but a spring blow-down was in part responsible for a continuation of the outbreak. This insect killed a few white firs, weakened by the fir needle miner, in Bryce Canyon National Park, southern Utah. The Park Service has cut and treated infested trees as they became evident, and serious loss of trees along the Rainbow Point road in the Park has been prevented. The fir engraver also caused extensive damage to stands of silver fir in Whatcom, Skagit, and Snohomish Counties, Wash., approximately 100 centers of epidemic infestation being located in 1949 and 1950. At the present time control is limited to salvage operations in the critically infested stands, with the hope of utilizing the dead timber and possibly preventing the spread of migrating beetles to other areas.

Engraver beetles attacked and killed numerous ponderosa pines on private lands near Ute Park, New Mexico. The outbreak apparently resulted from a build-up of beetles in felled trees and slash along a power-line right-of-way. A build-up of engraver beetles in pinyon also occurred along a power-line clearance in the Mesa Verde National Park, Colorado.

Several species of Ips (knausi Sw., oregoni Eichh., ponderosae Sw., integer Eichh., and cloudcrofti Sw.) were found associated with attacks by species of Dendroctonus in ponderosa pine stands on the Lincoln National Forest, New Mexico. Species of Ips were also associated with attacks of southern pines by the black turpentine borer, and in addition, were abundant on fire-damaged hard pines in some localities in the South. Trees on localized areas, up to one-half acre in size, were attacked and killed.

WEEVILS.--The white-pine weevil (Pissodes strobi (Peck)) continued to be one of the most important insect pests in the Northeastern and Lake States. Few plantations of white pine, jack pine, or Norway spruce escape some degree of attack by this insect over the years; in many white pine plantations every tree has been weeviled one or more times. Surveys in New York showed that in approximately 50 percent of the white pine plantations more than 25 percent of the trees were weeviled in 1950, whereas only about 7 percent of the Norway spruce plantations were as heavily attacked. White-pine weevil attack in New Jersey and New Hampshire was low in 1950 in all plantations surveyed. In scattered Christmas tree plantations in the Lake States as high as 15 percent of the trees were weeviled.

In recent years the pine reproduction weevil (Cylindrocopturus eatoni Buch.) has become a major forest pest in brushfield areas following the extensive planting of Jeffrey and ponderosa pines. This insect is native to the forested lands in California and is of economic importance only in artificially regenerated areas. A new outbreak appeared in 1949 in the Burney brushfield planting, Shasta County. It was sprayed in the spring of 1950 with DDT in oil by helicopter. A check of results, made in the fall of 1950, indicated successful control. A small planting at Plummer Ridge, El Dorado County, was treated under less favorable conditions, with results not yet determined.

SHOOT AND TIP MOTHS.--Recent surveys have shown the European pine shoot moth (Rhyacionia buoliana (Schiff.)) to be more widely scattered in red pine plantations in New York than had previously been realized. Generally speaking, damage was severe in 1950 in the southeastern part of the State and in some sections of the south-central and western counties. No damage has occurred in the northern half of the State. In New Jersey, damage was severe in all parts of the State except in the higher elevations of the northwestern portion. In Connecticut, only the northern half of the State has escaped damage. The insect is practically non-existent in Massachusetts except in the southeastern part of the State where light damage occurred. Two red pine plantations, 31 and 9 acres in area, on the Allegheny National Forest, Pennsylvania, were heavily infested in 1950 by this insect, and control operations will be carried out in 1951. Heavy infestations were reported in northeastern Ohio and southern Michigan.

The Nantucket pine moth (Rhyacionia frustrana (Comst.)) has caused considerable injury since 1948 in a 13-year-old red pine plantations covering 2 acres on the Monongahela National Forest, West Virginia. An examination in July 1950 showed that approximately 35 percent of the tips were attacked. So far as could be determined, no other nearby plantation were infested. The trees are 15 to 18 feet in height, and the leader growth for the past 3 years has been satisfactory. Although it is believed that these trees will outgrow the effects of the attack, control with a 1-percent DDT emulsion was suggested to prevent spread to plantations in the vicinity. The variety, R. frustrana bushnelli (Busck), continued to cause considerable damage to several species of hard pines in plantations and natural growth on the Nebraska National Forest. Severe damage to young hard pine trees occurred throughout the South, and in some areas nearly every tip was attacked and killed. Some damage was reported in shortleaf pine on the Shawnee National Forest in southern Illinois.

A tip moth (Eucosma sonomana Kearf.) was widely distributed throughout the Lake States. In local infestations the larvae destroyed as much as 25 percent of the terminal growth of jack pine. A pitch twig moth (Petrova albicapitana (Busck)) was generally present on pine throughout the Lake States. Infestations in localized areas approached 100 percent and caused limited leader breakage.

**SARATOGA SPITTLEBUG** (Aphrophora saratogensis (Fitch)).--This insect continued to be very important in the Lake States. Approximately 10,000 acres of heavily infested plantations of jack and red pines on the Nicolet National Forest in northern Wisconsin, and 300 acres of the same hosts on the Hiawatha National Forest in upper Michigan, were sprayed by the Forest Service to reduce the adult populations. Elsewhere in the Lake States region this spittlebug remained at endemic levels. The closely related pine spittlebug, A. parallela (Say), was present in scattered, heavy roadwide infestations of jack and Scotch pines in upper Michigan. It also was reported to be common on pine in various localities in the South.

**CALIFORNIA FLATHEADED BORER** (Melanophila californica Van D.)--Incipient attacks by this cambium-mining borer often predispose both ponderosa and Jeffrey pines to lethal attacks by bark beetles. In some cases, tree killing may result without the association of other insects. Last year in California progressive attacks by this borer resulted in the killing of many of the trees reserved for the future timber crop on cut-over lands in portions of Lassen and Plumas Counties. Tree mortality elsewhere in the State was light, and infested individual trees were widely scattered throughout the timbered lands.

**SAWFLIES**--Several species of sawflies were of importance in various parts of the United States. Within the 15,000,000 acres of infested larch type in northern Minnesota approximately 225,000 acres were seriously defoliated in 1950 by the larch sawfly (Fristiphora erichsonii (Htg.)). Continued severe defoliation over a period of years may result in tree mortality, although little has occurred up to the present time. This sawfly was reported in endemic status in northern Wisconsin.

The jack pine sawfly (Neodiprion americanus banksianae Roh.) occurred in epidemic status on 500 acres of jack pine on the Tamarack wildlife refuge in northwestern Minnesota, and a local infestation was found on 100 acres of jack pine type near Tawas, Mich. Treatment of both areas in 1951 was recommended.

The red-headed pine sawfly (Neodiprion lecontei (Fitch)) occurred in localized epidemic status on red pine in central Michigan school plantations, but was endemic throughout the remainder of the Lake States on National Forests in the southern part of the North Central Region. This species was found widely scattered on jack and red pines in many areas in New York but populations were light. It was also reported to be building up in hard pine stands in northeast Texas, and was observed in small localized areas in other parts of the South.

A species of Neodiprion which had reached outbreak proportions on over 1,000,000 acres of hard pine in southern Arkansas in 1945-46 continued its decline in 1950. Defoliation was light and the infested area was much smaller than in previous years. This same species was in epidemic status on approximately 1,500 acres of hard pine near Urania, La. and control measures in 1951 were recommended.

Defoliation of scattered trees in many red pine plantations in New Jersey by Neodiprion sertifer (Geoff.) occurred in 1950, and plantations which needed treatment were sprayed with aerial applications of DDT. Outbreaks of this species occurred locally in Michigan, and it was reported for the first time in outbreak form and heavy egg populations were found on 225 acres of mixed red, Japanese red, shortleaf, pitch, and ponderosa pines on the Henderson State Forest, northwestern Illinois. Control was recommended in this last-named area.

A sawfly on pinyon pine at the Mesa Verde National Park and the Colorado National Monument was numerous in 1950 and severe defoliation on limited areas may occur in 1951.

LEAF MINERS.--The lodgepole needle miner (Recurvaria milleri Busck) has caused considerable loss of foliage of lodgepole pine on the Minidoka National Forest, southern Idaho, during the last 3 or 4 years. It has also been reported on the Targhee National Forest. Little or no tree killing has resulted. This needle miner has persisted in an endemic condition in lodgepole pine stands throughout the Tuolumne and Merced watershed, and in some seasons heavy defoliation occurs. Thus far only slight tree mortality has occurred despite heavy defoliation in 1950.

The fir needle miner (Epinotia meritana Hein.), which has been in outbreak form on white fir in Bryce Canyon National Park, Utah, was brought under control by airplane spraying with DDT in 1948 and 1949. In 1950 it was present in small numbers only and caused little or no damage.

The arborvitae leaf miner (Argyresthia thuella (Pack.)) caused very pronounced browning of the northern white cedar in central and eastern Maine. Severe injury in some stands was reported by the State Entomologist and experiments in control by aerial application of DDT were carried out.

SCALE INSECTS.-- Surveys conducted in southwestern Connecticut and in Westchester County and on Long Island in New York revealed the presence of a Matsucoccus scale on red pine in three general localities. Tree mortality in some of the areas examined indicates that this insect, whose specific identity has not been determined, has been established for some time. In Connecticut it is still confined primarily to the area around the reservoirs of the Bridgeport Hydraulic Company but there has been a gradual spread to surrounding plantations.

A Matsucoccus scale, probably gallicola Morrison, was discovered in 1950 on dying young pine trees near Daytona, Fla. The Prescott scale (M. vexillorum Morr.) on ponderosa pine and the pinyon scale (M. acalyptus Herb.) continued in outbreak proportions in 1950 in the Grand Canyon National Park. Attempts to control these scale insects might better await study of their biologies and of their control by chemicals.

The black pine-leaf scale (Aspidiotus californicus Colm.) was present on many dying ponderosa pine trees in Spokane, Wash., and vicinity, but was not the primary cause of tree mortality.

WALKINGSTICK (Diapheromera femorata (Say)).--Although 1950 was the "off year" for this insect in the Lake States, two outbreaks of significance occurred. In central Michigan approximately 160,000 acres of oak type were severely defoliated. No tree mortality was reported from this area and no control work was done. In central Wisconsin an outbreak covering approximately 300 acres occurred during the season, of which 200 acres were treated with insecticides by airplane.

HEMLOCK LOOPERS (Lambdina spp.).--Several small areas of hemlock looper infestation, totaling some 400 acres, were present in Clallam County, Wash., in 1949. By 1950 these infestations had spread to approximately 5,000 acres. The outbreak has not yet reached serious proportions, however, and further observations are planned to determine the need for control measures in the spring of 1951.

There were several heavily infested hemlock stands in the Hillsboro-Peterboro area of southern New Hampshire and in portions of east central Vermont, near the New Hampshire border in 1950. Considerable tree mortality has occurred in some of the stands as a result of defoliation in 1949. Several areas, some of commercial importance and others of recreational and campsite value, totaling about 175 acres, were sprayed with DDT from an airplane, with good results.

TENT CATERPILLARS (Malacosoma spp.).--The forest tent caterpillar (M. disstria Hbn.) continued to be very abundant in Minnesota, where approximately 700,000 acres of aspen type were infested, of which 220,000 acres were heavily attacked. The Forest Service plans to spray recreational areas within this infested zone in 1951. Outbreaks were also reported on the Sullys Hill Wildlife Refuge and adjacent Indian lands in North Dakota. Heavy defoliation of tupelo and black gum occurred in the Southeast, especially in Alabama, where many trees were completely defoliated early in the season.

The Great Basin tent caterpillar (M. fragilis Stretch ) continued in outbreak status in aspen stands in the southern part of Colorado and Northern New Mexico. Approximately 16,000 acres of aspen type of the Carson and Santa Fe National Forests, in New Mexico, were sprayed with DDT by airplane in 1950 with excellent results. However, there were indications by the late fall, that much of the sprayed area had been invaded by moths from surrounding untreated stands. Despite this limited control effort the outbreak seems to be increasing in scope, and it is expected that not only some tree mortality will result but that recreational use of the infested areas will be seriously disturbed. Additional spraying in 1951 may be required in the same general area of 1950 treatment.

This species was also very abundant in southern Utah in 1950. Large numbers of cottonwood trees along the Virgin River were defoliated. The National Park Service sprayed the trees on the valley floor in Zion National Park, applying DDT by mist blower, with good results. Bitterbrush and other shrubs were also heavily infested over a wide area.

CONE INSECTS.--Destruction of seed in the developing pine cones, by insects, has assumed considerable importance since the great expansion of planting programs in the Southeast. In 1950, the damage was particularly noticeable on loblolly pine in Virginia and North Carolina. Two species of the moth Laspeyresia appeared to be the most important.